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EXAMINER	
LEUNG, CHRISTINA Y	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/775,911	MORGAN, DENNIS R.	
	Examiner	**Art Unit**	
	Christina Y. Leung	2613	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 14 February 2008.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-22 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-5,7-12 and 14-22 is/are rejected.

7)☒ Claim(s) 6 and 13 is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. **Claims 1-4 and 13-16** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Madsen et al.** ("Optical filter architecture for approximating any 2 x 2 unitary matrix," Optics Letters, vol. 28, no. 17, April 1, 2003, pages 534-536) in view of **MacFarlane et al.** (US 6,687,461 B1).

Regarding **claim 1**, Madsen et al. disclose a method for compensating for polarization mode dispersion in an optical fiber communication system (Figures 1-3), comprising the steps of:

reducing the polarization mode dispersion using a cascade of all-pass filters (see Abstract and Figure 3); and

adjusting coefficients of the all-pass filters (see page 535, left column, first complete paragraph).

Regarding **claim 13**, as similarly discussed above with regard to claim 1, Madsen et al. disclose a polarization mode dispersion compensator in an optical fiber communication system, comprising:

a cascade of all-pass filters having coefficients that are adjusted (again, see Abstract, Figure 3, and page 535, left column, first complete paragraph).

Regarding claims 1 and 13, Madsen et al. disclose adjusting the coefficients using a least squares algorithm (see page 535, left column, first complete paragraph) but do not specifically disclose adjusting the coefficients using a least mean square algorithm.

However, various optimization algorithms are well known in the signal processing and communication arts, and MacFarlane et al. in particular teach a system that is related to the one described by Madsen et al. including optical filters for compensating polarization mode dispersion having adjusted coefficients (column 1, lines 28-53; column 2, lines 51-65; column 5, lines 23-42). MacFarlane et al. specifically teach that the apparatus compensates signal irregularities "including chirp, polarization, and frequency dispersion" (column 1, lines 43-46). MacFarlane et al. further teach that the filter coefficients may be adjusted using a variety of minimization algorithms, including a least squares algorithm or a least mean square algorithm (column 19, lines 16-22).

Regarding claims 1 and 13, it would have been obvious to a person of ordinary skill in the art to specifically use a least mean square algorithm as taught by MacFarlane et al. in the system disclosed by Madsen et al. as an engineering design choice of another way to provide the minimization function already disclosed by Madsen et al. (Madsen et al., page 535, left column, first complete paragraph) and thereby effectively adjust the filter coefficients to quickly and accurately compensate dispersion. Both Madsen et al. and MacFarlane et al. teach various algorithms for performing a minimizing function, and it would have been obvious to a person of ordinary skill in the art to substitute one minimization algorithm for another to achieve a predictable result of optimizing the filter coefficient values. Furthermore, MacFarlane et al.

particularly teach the substitution of least mean square algorithm for a least squares algorithm (column 19, lines 16-22).

Regarding **claims 2 and 14**, Madsen et al. disclose that the cascade of all-pass filters comprises a two-channel structure consisting of multiple cascades of all-pass filters and directional couplers (Figure 3).

Regarding **claims 3 and 15**, Madsen et al. disclose that the coefficient values are adjusted to minimize a cost function (page 535, left column, first complete paragraph). Examiner notes that MacFarlane et al. also teach adjusting filter coefficients to minimize a cost function (column 19, lines 16-22).

Regarding **claims 4 and 16**, Madsen et al. disclose measuring the polarization mode dispersion in a received optical signal (using the "estimate channel" element shown in Figure 1; see also page 534, left column, second complete paragraph).

3. **Claims 5 and 17** rejected under 35 U.S.C. 103(a) as being unpatentable over **Madsen et al.** in view of **MacFarlane et al.** as applied to claims 4 and 16 respectively above, and further in view of **Applicant's Admitted Prior Art**.

Regarding **claims 5 and 17**, Madsen et al. in view of MacFarlane et al. describe a system and a method as discussed above with regard to claims 4 and 16 respectively, including a step of measuring the polarization mode dispersion in a received optical signal. They do not specifically suggest that the measuring step employs a tunable narrowband optical filter to render information from energy detector measurements.

However, Applicant's Admitted Prior Art (Applicant's Figures 1-3) suggests a system that is related to the one described by Madsen et al. in view of MacFarlane et al., including a

polarization mode dispersion compensator 110 and a channel estimate element 300 for measuring polarization mode dispersion in a received optical signal (Applicant's specification, page 3, lines 3-25). Applicant's Admitted Prior Art further suggests that the measuring step employs a tunable narrowband optical filter 304 to render information from energy detector measurements (see Applicant's Figure 3 and specification, page 3, lines 26-32 and page 4, lines 1-4).

Regarding claims 5 and 17, it would have been obvious to a person of ordinary skill in the art to include a tunable narrowband optical filter as taught by Applicant's Admitted Prior Art in the system described by Madsen et al. in view of MacFarlane et al. in order to effectively provide the polarization mode dispersion measurement already disclosed by Madsen et al. and thereby enable the filters to compensate for the dispersion accurately.

4. **Claims 7-10 and 18-21** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Madsen et al.** ("Optical filter architecture for approximating any 2 x 2 unitary matrix," Optics Letters, vol. 28, no. 17, April 1, 2003, pages 534-536) in view of **Eyal. et al.** ("Design of Broad-Band PMD Compensation Filters," IEEE Photonics Technology Letters, vol. 14, no. 8, August 2002, pages 1088-1090).

Regarding **claim 7**, Madsen et al. disclose a method for compensating for polarization mode dispersion in an optical fiber communication system (Figures 1-3), comprising the steps of:

reducing the polarization mode dispersion using a cascade of all-pass filters (see Abstract and Figure 3); and

adjusting coefficients of the all-pass filters (see page 535, left column, first complete paragraph).

Regarding **claim 18**, as similarly discussed above with regard to claim 7, Madsen et al. disclose a polarization mode dispersion compensator in an optical fiber communication system, comprising:

a cascade of all-pass filters having coefficients that are adjusted (again, see Abstract, Figure 3, and page 535, left column, first complete paragraph).

Regarding claims 7 and 18, Madsen et al. disclose adjusting the coefficients using a least squares algorithm (see page 535, left column, first complete paragraph) but do not specifically disclose adjusting the coefficients using a Newton algorithm.

However, various optimization algorithms are well known in the signal processing and communication arts, and Eyal. et al. in particular teach a system that is related to the one described by Madsen et al. including optical filters for compensating polarization mode dispersion having adjusted coefficients (page 1088). Eyal et al. further teach that the filter coefficients may be adjusted using a Newton algorithm (page 1089, see particularly the end of the first paragraph of the right column).

Regarding claims 7 and 18, it would have been obvious to a person of ordinary skill in the art to specifically use a Newton algorithm as taught by Eyal et al. in the system disclosed by Madsen et al. as an engineering design choice of another way to provide the minimization function already disclosed by Madsen et al. (Madsen et al., page 535, left column, first complete paragraph) and thereby effectively adjust the filter coefficients to quickly and accurately compensate dispersion. Both Madsen et al. and Eyal et al. teach various algorithms for performing a minimizing function, and it would have been obvious to a person of ordinary skill

in the art to substitute one minimization algorithm for another to achieve a predictable result of optimizing the filter coefficient values.

Regarding **claims 8 and 19**, Madsen et al. disclose that the cascade of all-pass filters comprises a two-channel structure consisting of multiple cascades of all-pass filters and directional couplers (Figure 3).

Regarding **claims 9 and 20**, Madsen et al. disclose that the coefficient values are adjusted to minimize a cost function (page 535, left column, first complete paragraph). Examiner notes that Eyal et al. also teach adjusting filter coefficients to minimize a cost function (page 1089).

Regarding **claims 10 and 21**, Madsen et al. disclose measuring the polarization mode dispersion in a received optical signal (using the "estimate channel" element shown in Figure 1; see also page 534, left column, second complete paragraph).

5. **Claims 11 and 22** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Madsen et al.** in view of **Eyal et al.** as applied to claims 7 and 18 respectively above, and further in view of **Applicant's Admitted Prior Art**.

Regarding **claims 11 and 22**, Madsen et al. in view of Eyal et al. describe a system and a method as discussed above with regard to claims 7 and 18 respectively, including a step of measuring the polarization mode dispersion in a received optical signal. They do not specifically suggest that the measuring step employs a tunable narrowband optical filter to render information from energy detector measurements.

However, Applicant's Admitted Prior Art (Applicant's Figures 1-3) suggests a system that is related to the one described by Madsen et al. in view of Eyal et al., including a polarization mode dispersion compensator 110 and a channel estimate element 300 for

measuring polarization mode dispersion in a received optical signal (Applicant's specification, page 3, lines 3-25). Applicant's Admitted Prior Art further suggests that the measuring step employs a tunable narrowband optical filter 304 to render information from energy detector measurements (see Applicant's Figure 3 and specification, page 3, lines 26-32 and page 4, lines 1-4).

Regarding claims 5 and 17, it would have been obvious to a person of ordinary skill in the art to include a tunable narrowband optical filter as taught by Applicant's Admitted Prior Art in the system described by Madsen et al. in view of Eyal et al. in order to effectively provide the polarization mode dispersion measurement already disclosed by Madsen et al. and thereby enable the filters to compensate for the dispersion accurately.

Allowable Subject Matter

6. **Claims 6 and 12** are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

7. The following is a statement of reasons for the indication of allowable subject matter:

The prior art, including Madsen et al., MacFarlane et al., Eyal et al., and Applicant's Admitted Prior Art, does not specifically disclose or fairly suggest a method including all of the limitations and steps recited in claims 6 or 12 (and including all of the limitations of their respective parent claims).

Response to Arguments

8. Applicant's arguments filed 14 February 2008 have been fully considered but they are not persuasive.

Regarding Applicant's assertion on pages 7-11 of the response that MacFarlane et al. and Eyal et al. do not teach all-pass filters, Examiner respectfully notes that the rejections above rely upon Madsen et al. for a disclosure of all-pass filters in combination with additional teachings of MacFarlane et al. or Eyal et al. with respect to a particular optimization algorithm. In response to Applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.,* 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Regarding Applicant's assertion on page 7 of the response that MacFarlane et al. do not teach polarization dispersion compensation, Examiner respectfully notes that MacFarlane et al. specifically teach that their apparatus compensates signal irregularities "including chirp, polarization, and frequency dispersion" (column 1, lines 43-46). Furthermore, Madsen et al. already disclose adjusting all-pass filter coefficients, and MacFarlane et al. teach another minimization/optimization algorithm that is also known in the art.

Regarding Applicant's assertion on page 10 of the response that Eyal et al. do not teach the adjustment of filter coefficients, Examiner respectfully notes that Eyal et al. teach using a Newton algorithm to optimize variables in equations for producing optimized filter coefficients and thereby teach "adjusting" coefficients using a Newton algorithm as recited in the claims. Furthermore, Madsen et al. already disclose adjusting all-pass filter coefficients, and Eyal et al. teach another minimization/optimization algorithm that is also known in the art.

In response to Applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or

modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988)and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, Examiner respectfully maintains that Madsen et al, MacFarlane et al., and Eyal et al. teach various algorithms for performing a minimizing function, and it would have been obvious to a person of ordinary skill in the art to substitute one minimization algorithm for another in optimizing the all-pass filters disclosed by Madsen et al. to achieve a predictable result of optimizing the filter coefficient values. Regarding Applicant's assertions on pages 8 and 10 that "an all-pass filter is not advantageous," Examiner again respectfully notes that Madsen et al. *explicitly disclose* all-pass filters as discussed above. Madsen et al. already disclose using a least squares algorithm to optimize the all-pass filters, and MacFarlane et al. and Eyal et al. are relied upon to provide teachings of other minimization/optimization algorithms that are also known in the art.

Regarding Applicant's assertion on page 10 of the response that "the adaptation equations for FIR filters do not apply to the adaptation of an all-pass filter," Examiner respectfully notes that the claims rejected above do not specifically recite particular equations. In response to Applicant's argument that the references fail to show certain features of Applicant's invention, it is noted that the features upon which Applicant relies (i.e., particular equations) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

Conclusion

9. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christina Y. Leung, whose telephone number is 571-272-3023. The examiner can normally be reached on Monday to Friday, 8:30 to 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jason Chan, can be reached at 571-272-3022. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR

system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Christina Y. Leung/

Primary Examiner, Art Unit 2613